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ABSTRACT

The need for a system of price indexes for colleges and universities is discussed. First, past efforts to develop price indexes are reviewed, dating back to 1952 and highlighting two specific indexes, the Higher Education Price Index (HEPI) and the Uniform Price Index Calculation System (UPICS). For the latter, the price indexes of direct costs for 1973, 1978, and 1983 are charted by the following categories: (1) institution type (doctoral, baccalaureate, comprehensive, 2-year, all), (2) function (instruction, research, public service, academic support, student service, institutional support, plant operation and maintenance), and (3) object (academic staff, other staff, fringe benefits, services, supplies and materials, books and printing, equipment, occupancy and maintenance). The UPICS indexes are then compared to three other frequently-used indexes. Average annual rate of inflation is also included. The formula used to calculate these indexes is then explained. Finally, the use of other price indexes, not specifically designed for higher education, is discussed. It is concluded that higher education needs its own indexes to reflect the complexity of functions and objects of expense. (MSE)

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PRICE INDEXES FOR INSTITUTIONS OF HIGHER EDUCATION

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Key Words: Laspeyres, postsecondary education, costs, price relatives

Abstract: This paper provides a general discussion of the need for a system of price indexes specific to institutions of higher education (colleges and universities). Past efforts to develop higher education price indexes are surveyed. The importance of, and difficulties in, obtaining these indexes by *function* (for example, research or instruction) are examined. Among other topics considered are the practical need to "borrow" price relatives from other published indexes and the problems of obtaining detailed institutional expenditure estimates to form the market basket of goods and services to be used to weight the indexes.

Introduction

In 1973, the National Commission on the Financing of Higher Education wrote that "Postsecondary education is one of the few major industries without formal price and cost index information specifically tailored to institutional and consumer needs" (quoted in Baughman, 1979, p. 2.1). Despite some progress since then, there is still no officially sponsored higher education price index produced on a sustained and regular basis.

The first three sections of this paper (after the introduction) describe what has been accomplished so far in developing higher education price indexes. The fourth section explains the formula used to compute these indexes. The fifth section treats the use of other price indexes, not specifically designed for higher education, as substitutes for a higher education price index. The paper concludes with a discussion section.

Throughout this paper, all price indexes discussed are *intertemporal* indexes; that is, they measure price change over time. *Interarea* (e.g. interstate) price indexes, which measure price differences among geographic areas, are not covered. Interarea indexes are of great importance for elementary and secondary schools but have not received the same degree of attention at the higher education level. This paper concentrates only on the situation in the United States although it would be of value to learn about higher education price indexes for other countries.

I. Early Price Indexes for Higher Education

John D. Millett published in 1952 what seems to be the first price index for institutions of higher education. In fact, it was not until the 1970's that further major efforts were made to develop such indexes. Millett divided higher education expenditures into three categories: faculty salaries (43%), non-faculty salaries (28%), and supplies and services (29%) (Baughman, 1979, p. 2.2). The percentages were developed from a survey of twenty-three colleges and universities.

Based closely on the methods of Millett, O'Neill (1971, Appendix B) developed price indexes for higher education instructional operating expenditures. Jaffe (1972) constructed a price index for academic research and development. Several other higher education price indexes, referenced in Baughman (1979), were produced in the mid-1970's.

II. The Higher Education Price Index (HEPI)

The Higher Education Price Index (HEPI) was developed at the U.S. Office of Education by Kent Halstead (1975, 1983). Since 1981, the index has been calculated and reported each year by a private research firm, Research Associates of Washington. HEPI is the first higher education price index to be reported on a *continuing* basis.

Halstead (1983, p. 51) describes the market basket of goods and services for HEPI as " . . . based predominantly on the 1971-72 buying patterns of those few colleges and universities in the United States that classify their expenditures by object group; i.e., salaries, supplies and material, communication, equipment, and the like. In particular, prime data sources were the expenditure records of the University of Wisconsin System and the Oklahoma State Regents for Higher Education."

In conjunction with HEPI, Halstead (1975, 1983) also developed some related specialized indexes, including a University Research and Development Price Index (R&DPI). The R&DPI uses the methodology of Jaffe (1972) but differs in the data series selected and other specifics of implementation. It "excludes indirect costs or overhead charges apportioned to research" (Halstead, 1983, pp. 93-4).

III. The Uniform Price Index Calculation System (UPICS)

In the late 1970's, the National Science Foundation (NSF), the American Council on Education, and the National Association of College and University Business Officers (NACUBO) investigated the feasibility of developing improved measures of the impact of inflation on academic research and development. In particular, measures were sought that incorporated both direct and indirect costs. The primary development work was carried out by George Baughman of Ohio State University and was " . . . successful in creating a computerized system for generating an academic research price index" (Hughes, 1979, p. 1).

Because the indirect costs of research draw upon almost all functions of higher education, the Uniform Price Index Calculation System (UPICS) was designed to compute price indexes of direct costs for each of the seven uniform functions recommended by NACUBO:

1. Instruction
2. Research
3. Public Service
4. Academic Support
5. Student Services
6. Institutional Support
7. Plant Operations and Maintenance.

The price indexes of direct costs by function (Baughman and Jenkins, 1985), of interest in their

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UPICS Price Indexes - 1967-83

	Index Values (1967 = 100)			Average Annual Rate of Inflation (Compound)		
				16 Years	10 Years	5 Years
	1973	1978	1983	1967-83	1973-83	1978-83
By Type						
Doctoral	138.7	191.0	283.9	6.7%	7.4%	8.2%
Baccalaureate	139.5	193.6	290.3	6.9	7.6	8.4
Comprehensive	139.6	191.5	285.2	6.8	7.4	8.3
Two Year	140.5	192.4	286.4	6.8	7.4	8.3
All Types	139.1	191.5	285.0	6.8	7.4	8.3
By Function (All Types)						
Instruction	139.5	186.5	272.1	6.5%	6.9%	7.8%
Research	135.4	189.3	280.3	6.7	7.5	8.2
Public Service	138.8	193.5	285.9	6.8	7.5	8.1
Academic Support	140.0	193.9	290.9	6.9	7.6	8.5
Student Service	139.7	192.1	285.6	6.8	7.4	8.3
Institutional Support	139.2	192.9	289.4	6.9	7.6	8.5
Plant Operation & Maintenance	140.7	217.1	352.8	8.2	9.6	10.2
By Object						
Academic Staff	137.2	177.8	252.2	6.0%	6.3%	7.2%
Other Staff	143.0	195.3	289.0	6.9	7.3	8.2
Fringe Benefits	197.7	324.3	568.6	11.5	11.1	12.0
Services	125.9	162.5	238.1	5.6	6.6	7.9
Supplies & Materials	113.0	160.9	230.9	5.4	7.4	7.6
Books & Printing	154.4	235.2	377.8	5.8	8.7	9.9
Equipment	118.1	169.2	234.8	5.5	7.1	6.8
Occupancy & Maintenance	147.6	250.2	425.9	9.5	11.2	11.2
Other Indexes Frequently Used in University Budgeting						
CPI	130.0	190.3	298.2	7.1%	8.7%	9.4%
HEPI	142.8	201.4	309.0	7.3	8.0	8.9
GNP-IPD	131.5	188.8	271.1	6.4	7.5	7.5

SOURCE: George W. Baughman and D. J. Jenkins (1985), *UPICS Higher Education Price Relatives by Function and Object of Expense 1967 - 1983*, page 5.

own right, are also aggregated by UPICS to form the price index of full costs (direct and indirect) of research and the price index of all costs. The methodology of UPICS was evaluated by a Price Indexes Evaluation Panel (1979), and the computer implementation of UPICS was evaluated by a Computer Systems Evaluation Panel (1979).

The scope of the UPICS project broadened as it went along. At some point the "U" in "UPICS", which originally stood for "University", was changed to "Uniform", presumably to reflect better the inclusion of colleges as well as universities in the system. Funding was provided by NSF and the National Center for Education Statistics (NCES).

The final UPICS reports (e.g. Baughman and Jenkins, 1985) are a rich source of higher education institutional price data for the years 1967-83. They include tabulations of price indexes by type of institution, function, and object of expense. For research there are also price indexes for selected academic disciplines. The table "UPICS Price Indexes - 1967-83" provides data on a selection of UPICS price indexes with three other price indexes included for comparison.

IV. Price Index Calculation: The Laspeyres Formula

All of the price indexes discussed above are of Laspeyres type; that is, they are based on a fixed market basket of goods and services (fixed weights) determined for a reference time period. There seems to be a consensus that this is the most appropriate type of index for adjusting higher education institutional expenditures. As Halstead (1983, p. 32) remarks: "In a fixed weight index, the relative weights of goods and services being priced are held constant. The index reports only price changes and may be interpreted as the change in resources required to offset the effects of inflation in buying the same kinds and amounts of goods and services previously purchased. When significant changes occur in the composition of the market basket being priced, weights are revised, but such revisions are held to an absolute minimum. The labor-intensive education process involves fairly stable inputs that lend themselves to such fixed-weight assignments."

The Laspeyres formula, used to describe such indexes, is as follows:

$$I_{t,0} = \frac{\sum P_{i,t} Q_{i,0}}{\sum P_{i,0} Q_{i,0}} \times 100$$

where

$P_{i,t}$ is the price for the ith item at time t

$P_{i,0}$ is the price for the ith item in the reference period 0

$Q_{i,0}$ is the quantity of the ith item purchased in the reference period 0.

All summations are over the subscript i as i ranges over the class of items (goods and services) relevant to the price index being computed.

In practice, a variation of this formula is used. The quantity measures $Q_{i,0}$ (physical counts) are difficult to obtain; moreover, their use would pose definitional difficulties in specifying a single item. To circumvent this problem, the Laspeyres formula can be rewritten:

$$I_{t,0} = \frac{\sum P_{i,t} Q_{i,0}}{\sum P_{i,0} Q_{i,0}} \times 100$$

$$= \frac{\sum \left(\frac{P_{i,t}}{P_{i,0}}\right)(P_{i,0} Q_{i,0})}{\sum (P_{i,0} Q_{i,0})} \times 100$$

so that

$$I_{t,0} = \frac{\sum R_{i,0,t} E_{i,0}}{\sum E_{i,0}} \times 100$$

where

$R_{i,0,t} = P_{i,t} / P_{i,0}$ is called the *price relative* for the ith item from the reference period to time t, and

$E_{i,0} = P_{i,0} \times Q_{i,0}$, the expenditure on the ith item in the reference period, is called the *expenditure weight* for item i.

The expenditure weights are detailed estimates of expenditures of institutions. Generally, the institutions must be surveyed directly to obtain these data. But these expenditure weights pertain to the reference period only; thus, the same set of weights can continue to be used for an extended period until it is necessary to revise the index and change the reference period.

The price relatives reflect price changes from the reference period to the current period. Therefore new data must be collected to calculate them each time the index is produced (in the case of HEPI and UPICS, this means once a year). It has not been the practice to collect these price data directly from the colleges and universities. Instead they are derived from data collected for other purposes. For example, current faculty salary price relatives may be derived from data collected by the American Association of University Professors or NCES. Price relatives for equipment may be computed from the component indexes of the Consumer Price Index (CPI) or the Producer (formerly Wholesale) Price Index, both published by the Bureau of Labor Statistics.

V. Proxy Indexes

An alternative to developing specialized price indexes for higher education is to adjust costs with one of the major U.S. government indexes intended for other purposes. Among the indexes commonly employed in this way are the CPI and the component indexes of the Gross National Product Implicit Price Deflator (GNP-IPD). These indexes are readily available and carefully scrutinized.

A major drawback is that these indexes are not based on the market basket of goods and services appropriate to higher education. Halstead (1983, p. 1) remarks that the CPI ". . . reports changes in

prices paid for food, clothing, shelter, transportation, and other goods and services that people buy for day-to-day living. Obviously, such an index is not appropriate for industry and for commercial and business enterprises that buy substantially different sets of goods and services involving different price changes or inflation rates. In fact each industry is sufficiently unique to require its own measure of inflation." Empirically the CPI, when used to adjust higher education costs, has generally underestimated the impact of inflation on higher education as measured by HEPI or UPICS (the late 1970's are an exception). This underestimation is commonly attributed to the labor intensive nature of higher education.

The GNP-IPD contains component indexes for the service industries, which are also labor intensive, and thus has some appeal as an alternative to HEPI or UPICS. But, using the 1960's as an example, Jaffe (1972, p. 3) notes that " . . . salary and wage increases in the general economy lagged behind academic salary increases in the first part of the decade but caught up with the pace in the latter part." The GNP-IPD indexes are also not completely reliable as substitutes for specialized higher education price indexes.

An important reason for producing higher education price indexes is the wealth of information contained in the component indexes by function and object of expense. These component indexes provide a much more complete picture of the impact of inflation on higher education than can be gleaned from the summary index alone.

VI. Discussion

The views in this Discussion, including the one that an updated price index of higher education is needed, are those of the author. No official support by the U.S. Department of Education should be inferred.

HEPI, produced for each year since 1961, provides a valuable uninterrupted series for measuring price change as it affects colleges and universities. It would be desirable to have also an index based on more recent expenditure weights (the ones for HEPI are from 1971-72). One approach would be to update UPICS which covers 1967-83. This would have the additional advantage of providing a full (direct and indirect) cost index for academic research, one of the component indexes of UPICS. The detailed expenditure estimates upon which UPICS is based, however, were collected in 1976. To the author, there seems to be a pressing need for new detailed expenditure estimates for higher education. Once collected, price indexes based on expenditure weights derived from these estimates and on current price relatives could be published regularly.

References

Baughman, George W. (1979), *University Price Index Calculation System - UPICS*, National Association of College and University Business Officers (Report to the National Science Foundation), Washington, DC.

Baughman, George W. and D. J. Jenkins (1985), *UPICS Higher Education Price Relatives by Function and Object of Expense 1967 - 1983*, Ohio State University (Report to the National Science Foundation and the National Center for Education Statistics), Columbus, Ohio.

Computer Systems Evaluation Panel (1979), *University Price Index Calculation System - UPICS*, National Association of College and University Business Officers (Report to the National Science Foundation), Washington, DC.

Halstead, D. Kent (1975), *Higher Education Prices and Price Indexes*, U.S. Department of Education, Washington, DC.

Halstead, D. Kent (1983), *Inflation Measures for Schools and Colleges*, U.S. Department of Education, Washington, DC.

Hughes, K. Scott (1979), *University Price Index Calculation System - UPICS: Executive Summary*, National Association of College and University Business Officers (Report to the National Science Foundation), Washington, DC.

Jaffe, Sidney A. (1972), *A Price Index for Deflation of Academic R&D Expenditures*, National Science Foundation, Washington, DC.

O'Neill, June (1971), *Resource Use in Higher Education*, The Carnegie Commission on Higher Education, Berkeley, California.

Price Indexes Evaluation Panel (1979), *University Price Index Calculation System - UPICS*, National Association of College and University Business Officers (Report to the National Science Foundation), Washington, DC.

*This paper is intended to promote the exchange of ideas among researchers and policy makers. The views are those of the author, and no official support by the U.S. Department of Education is intended or should be inferred.